PC-Controlled Blending Automation

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FLEX-BLENDER operation

Basics

The following description is for the PC based control system consisting of two units.

Unit1 is the controller box. It is located inside the rack containing all electrical equipment.

Unit2 is the PC based program BCS. It is located where convenient near the blender or optional in a control room.

The purpose of unit1 is to convert and scale analog source data, convert and scale digital input and output data, control blender valve and generate average values, time stamps, batch numbers and more. When a batch is started, all process relevant information is updated and controlled by unit1.

Unit2 is the user interface showing all process relevant data in individual windows on the screen. Each step in the process is specified with timestamp in the right side of the user interface.

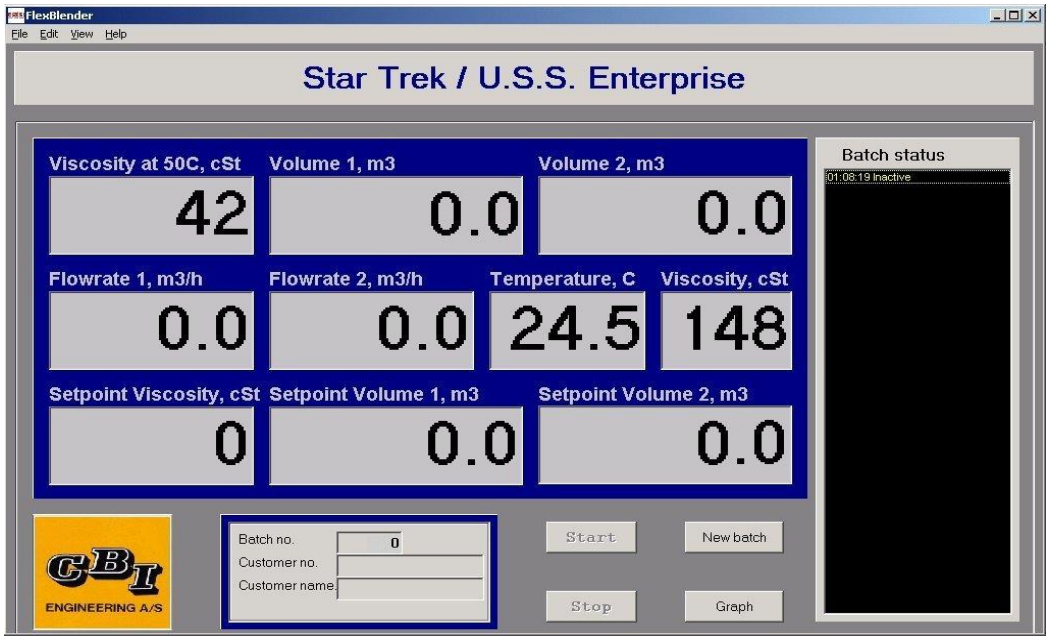
Furthermore the user interface has connection to a database. The database contains all collected report data, e.g. viscosity/temperature data together with customer-names and batch-numbers for generating of reports and graphs.

Starting the program

Click the “BCS” Icon on the desktop.

The user interface will open even without connection to the controller, and the first time it is started, following will show up on the screen.

Note: During blending, the interface must always be open. If not open, data will not be logged to the database. It is OK to minimize the window.

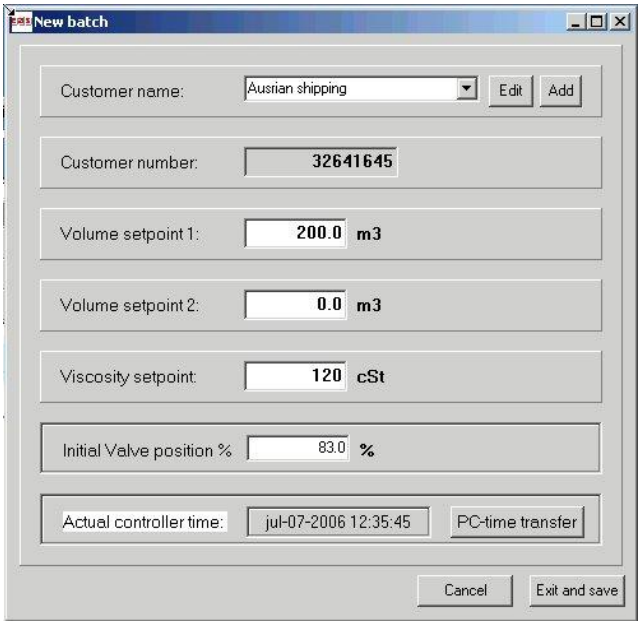


Preparations before the 1st blend

Usually a CBI technician carries out the preparation for actual bunker container. During the installation, the Supplier/Ship name text will be edited, and different system parameters are set to fit the actual installation. See contents of menu “Edit” in appendix 1.

Preparing to start a blend

Press “new batch”. Select the customer name from the drop-down list or press the button “Add new” to register a new customer in the database. Customer name and number can be any text/number, which fits into respective field. The “Edit” function is used if specification in the database has to be changed.



When Customer name and customer number is correct, key in “Volume setpoint”, “Viscosity setpoint” and press “Exit and save”. Set points are transferred to the controller.

Volume setpoint: The amount of oil wanted in the load.

The batch size must be between 0.0 and 9999.9 m3. If setpoint 1 is 0 (Zero), volume2 is the controlling parameter and the blender will not be activated.

Viscosity setpoint: The viscosity (at 50dgC used to adjust the blender so that the blend will be correct. The viscosity must be between 20 and 999 cSt.

Initial Valve position %: The position from right stop position to which the blender will be moved at blender start, if the left stop is active when the start button is pressed. If not active, the parameter is inactive.

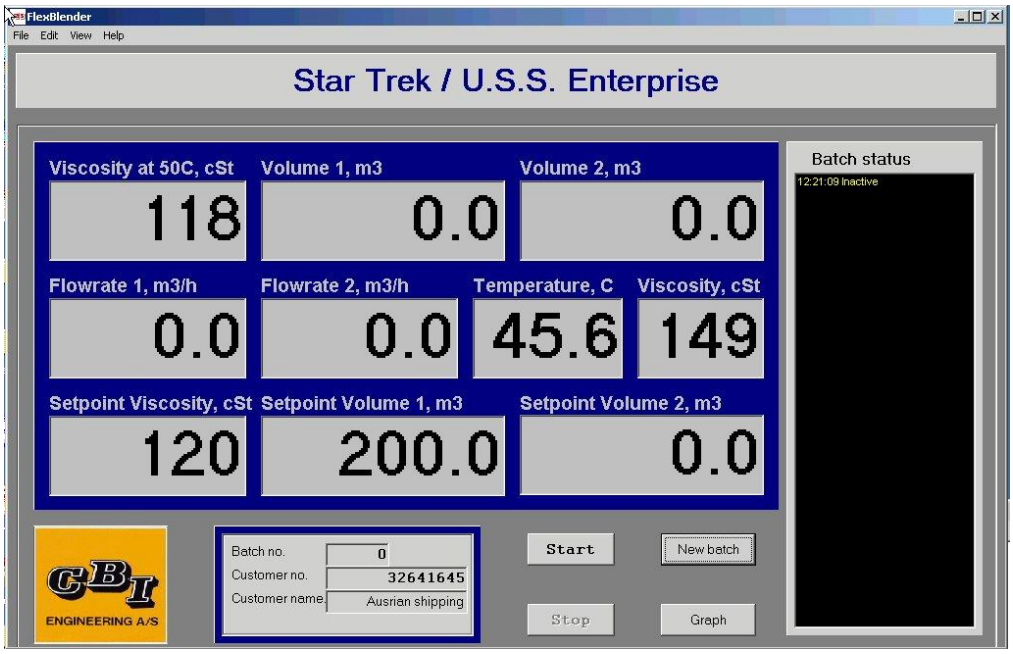
Note: It is a good idea to check “actual controller time” before leaving the window. By pressing “PC-time transfer”, the controller time will be synchronized to the PC-watch.

In order to get an accurate blending right from the start, it is very important to calculate the relationship between the heavy fuel oil and the light fuel oil, to be able to adjust the fuel blender before blending start. This will minimise time of equipment to find the right blend, and give a much better result on the first delivered bunker cubic meters.

- Ensure that both valves on inlet are open, and valve on outlet is closed.
- Start the pumps for the fuel blending.
- Please observe that the pressure inputs on the blender are equal +/-0,5 bar and not less than 3-4 bar, otherwise the blender will not work correctly.

Starting / stopping / canceling.

When all data have been inserted and all selections have been made, check the BCS main screen to ensure everything is ready for start. The only incorrect parameter should be the batch number.



The batch operation is started by pressing “Start”.

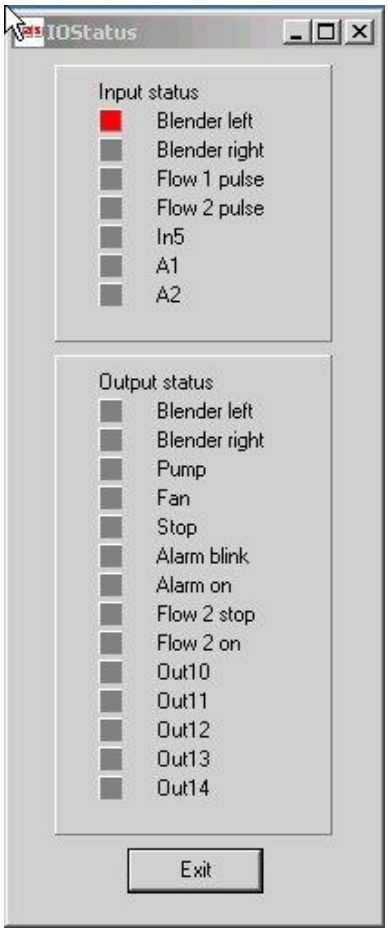
The Batch number is then updated and within few minutes the Batch status will be as shown below, indicating that the batch is running.

The operator now needs to do the following:

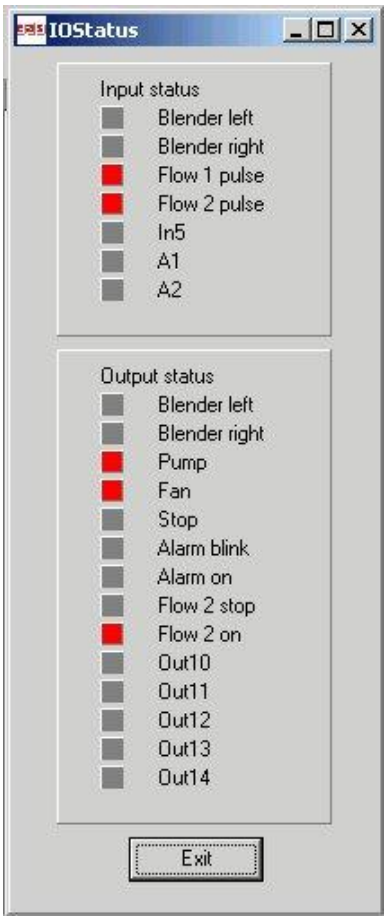
- After positioning, start bunkering by opening the outlet valve slowly.
- Mind the input pressures on the blender. Observe the pressures mentioned earlier.
- Now read the viscosity at 50^{o}C on the BCS display.
- Observe the viscosity for 2-3 minutes.
- The blender will automatically adjust in small steps if necessary.

Examples: I/O status display.

Controller inactive.



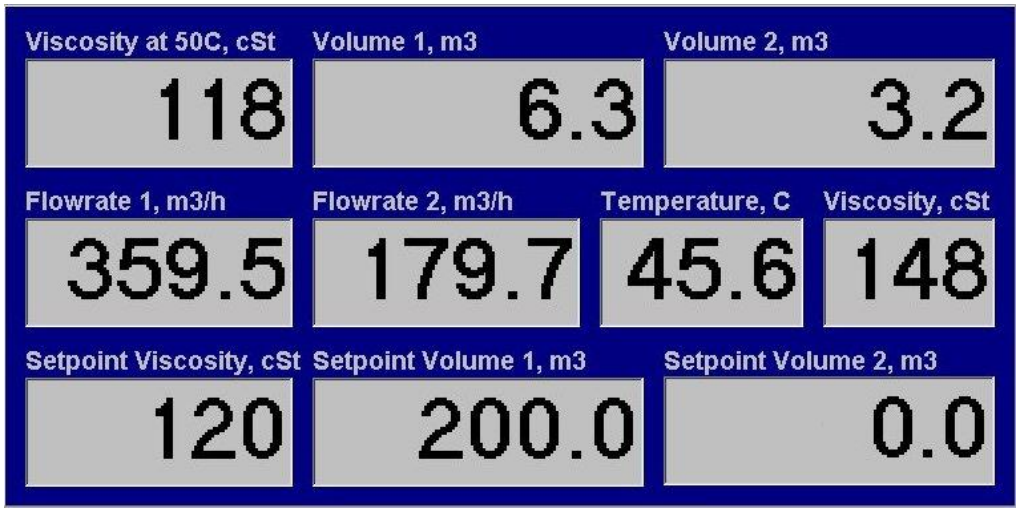
Normal blender-batch



Display after start

Following display is showing process values just after the regulator has been activated.

Note: Volume and Flow rate are always active. When “Start” is pressed the Volume is set to 0.

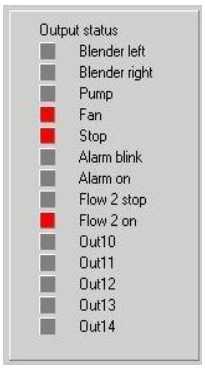


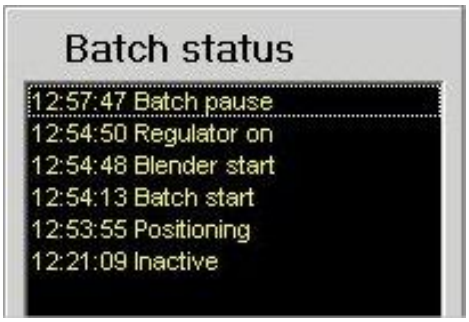
You can stop the batch by pressing the "Stop"-key, which will activate a menu where either “Pause” or “Cancel” can be selected.

Selecting “Pause” causes the controller to activate the stop signal at the output and at the same time stopping regulation, average calculation and alarm registration.

The actual output setting can be observed in the “I/O status” window.

I/O Status when paused





It is now possible to select either “cancel” (done by pressing “Stop” again) or “restart”.

To restart the batch, just press “Start”, whereby the stop signal is removed and regulator, alarm detection, average calculation, all are reactivated.

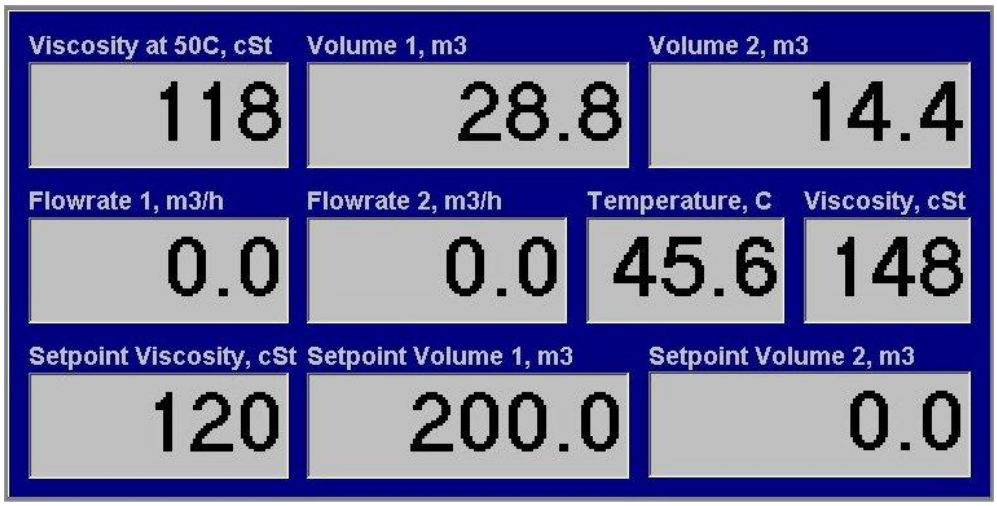
The batch status window shown left is the course of events for a process where both pause, restart and cancel were introduced.

As can be seen, the initial reaction on a stop (either caused by volume setpoint reached or cancel is pressed) is that the regulator awaits flow stop. When flow (1) is off, the volume registration is saved for reporting and the blender is positioning to be ready for a new batch.

At the moment where “inactive” is written in the batch status window, the report is ready, and in the report it will be noted if/that the batch was cancelled.

Actual BCS values when batch is cancelled.

Note: Flow1 is showing 0 (not necessarily flow2) and the volume is actual stop value.

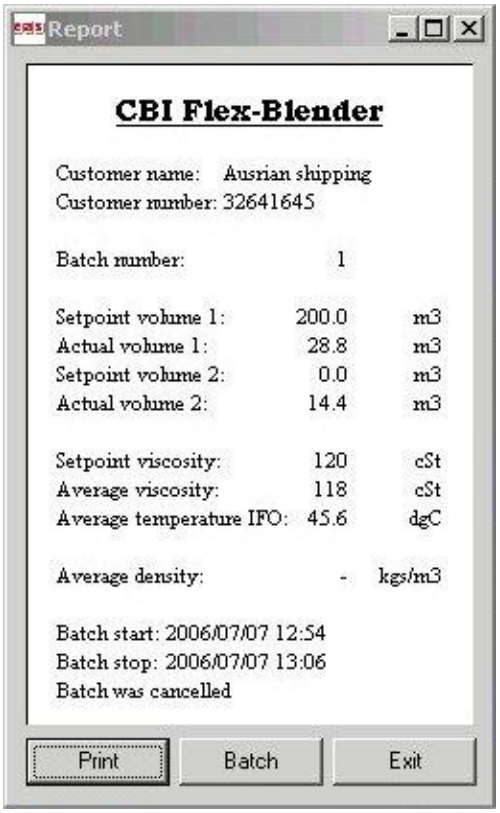


Report contents.

Report, showing specifications for the test batch.

When the blending/delivery is finished, stop the blending pumps.

- Fill the small tank underneath the viscosity-unit with clean gas oil.
- Flush the viscosity-unit by closing valves V103 + V104 and opening the valves V105 + V106, and starting the viscosity pump.
- After flushing, close all the valves.



Showing and printing report.

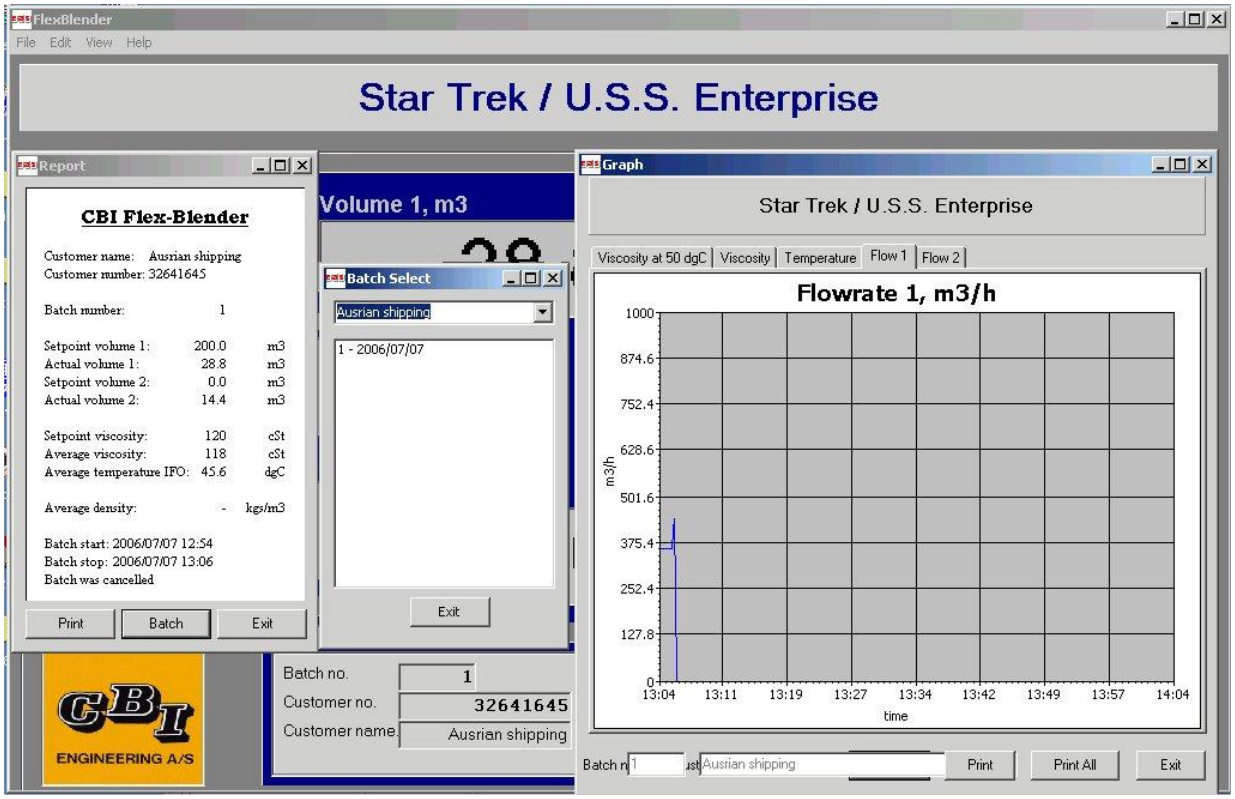
Now you can choose either to printout the report or just forgetting it for the moment. As long as the database is intact, it will be possible to recall it and print as many copies as wanted.

Show/print reports and graphs.

Usually the report for the actual batch will pop up at the moment when the batch is stopped and the status window tells “inactive”. Reselection of batch report is done by selecting “Report” from the top menu “View”. In the same way the graph can be called/recalled by selecting “Graph” in the “View” menu or by pressing the button “Graph” on the user interface.

The “Batch select” window will open when the Batch button is pressed.

From here, individual batches can be selected by choosing customer and then double clicking on the batch number, represented by Batch number and date. Immediately when clicking the no., all graph pages and the report will be updated, ready to inspect and/or print out.



FLEX BLENDER - Manual operation.

The motor operated blender can be set manually. Remember to turn of motor supply, before start operating.

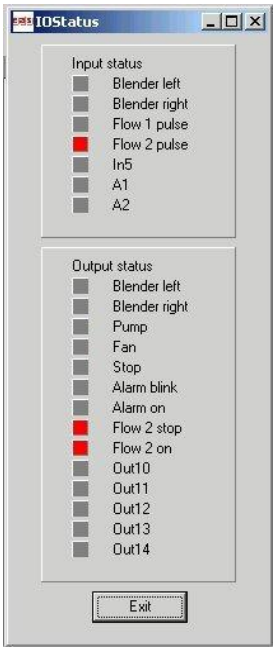
Running a batch on flow2 only

Setting ”Setpoint Volume 1” to ‘0’ activates batch where flow2 only is running. “Setpoint Volume 2” is set to wanted amount.

Start the batch by pressing “start”, and the typical

status for the process will be as shown.

The batch can be paused and cancelled exactly like a “blender batch”, and the report is generated like the “blender batch”.



I/O status when waiting for flow 2 to stop

Changing the PC during a batch.

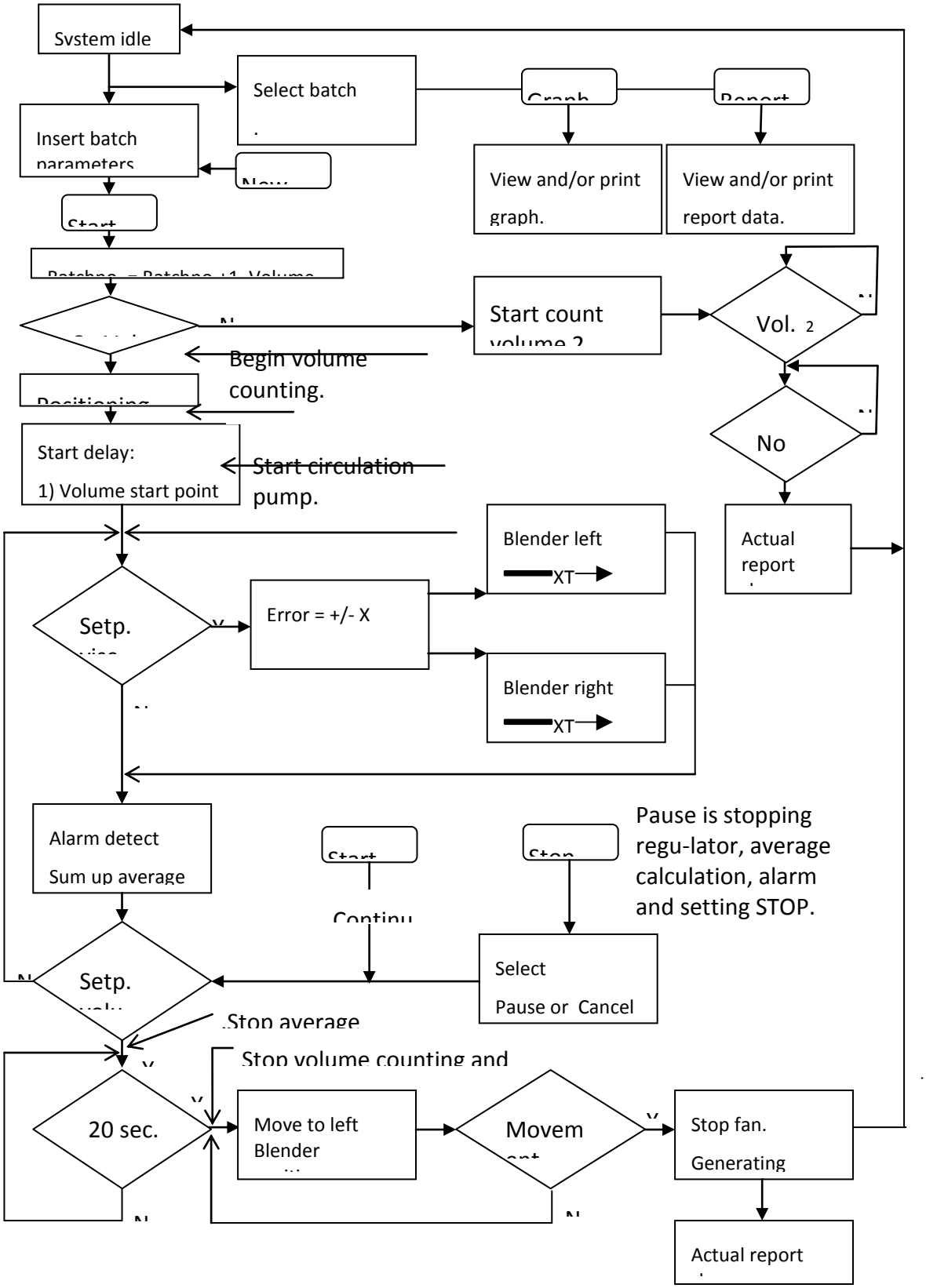
If the PC of some reason is changed during a batch (PC or parts of it has broken down), it is still possible to finish the running batch while the controller contains the batch number and all necessary information’s to finish it.

If the batch is running and a new PC is connected where BSC is installed, the user interface will be updated and if:

1) The database is a copy of the database which were active at PC stop time, logging will continue and all is working normally after the stop, only the graphs are missing data for the period where no PC were connected.
2) The database is empty. Then the display has no customer and therefore graph data are not logged, but at batch end the report is still correct for the whole batch, and can be printed as long as a new batch is not started.

If the PC is connected after finishing the batch, the report is still available as in situation 2 above.

Flexblender V2.1 process flowchart.



Appendix 1.

Settings:

This menu contains settings, which only have to be selected when the system is initiated or when a unit in the system is changed to another type. The menu point is password secured,

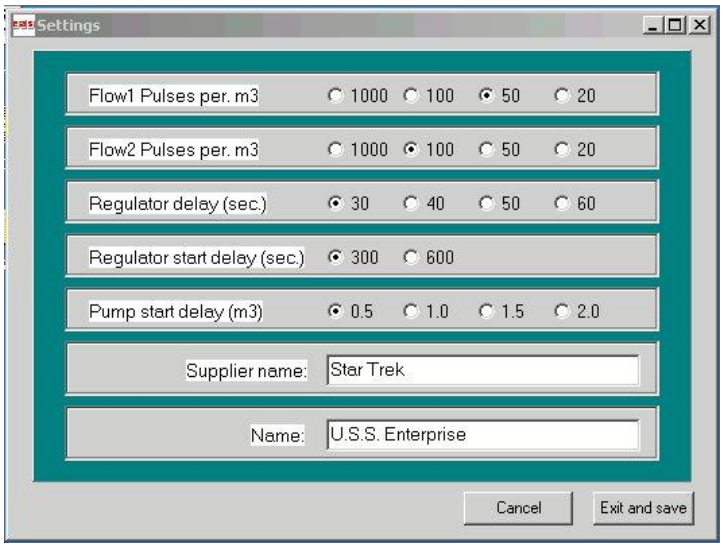
to prevent users from changing this by mistake.

The password is 6 digits as “050908”.

In the process, “Pump start delay”, is the first step after starting a batch, registering that flow is on. Second step is “Regulator start delay” which ensures sufficient time for the viscosity registration to be relevant. “Regulator delay” is a permanent delay per regulator pulse, which is necessary while the viscosity registration has to be stable after an adjustment.

“Pulses per m3” is the setting for actually installed volume pulse transmitter.

“Supplier name” and “Name” is the header text for the user interface.



Settings.ini:

The “settings.ini” file, located in the BCS folder, is where the BCS specific parameters are set.

Description and contents:

supplier=Star Trek	Supplier name as editable in the Settings menu.
shipname=U.S.S. Enterprice	Name as editable in the Settings menu.
Serial port=3	Port number used for BCS communication.
Serial baud=9600	Port baud rate (refers to controller baud rate)
interval=20	Time between loggings to DB. Can be 10, **20**, 30 (sec.)
database=BCS.GDB	Database name the BCS program is referring to.
password=default	Not used.

Note: Interval= 20 is default and should only be changed if batches are very small or very big.

Appendix 2.

Test batch example.

(Obs.: example without flow2)

The following report and graph example is a test batch running on following conditions.

Settings:

Pulses per m^3 = 100, Regulator delay = 30 sec., Regulator start delay = 300 sec. and Pump start delay = 1.0 m^3.

Set points: Volume 1 = 150.0, Volume 2 = 0, Viscosity = 140cSt.

Flow approx. 90m3/h

Batch started 17:37

Batch paused 17:48 (Flow stopped and adjustment made to equipment)

Batch restarted 18:21 (Batch started and flow re-established)

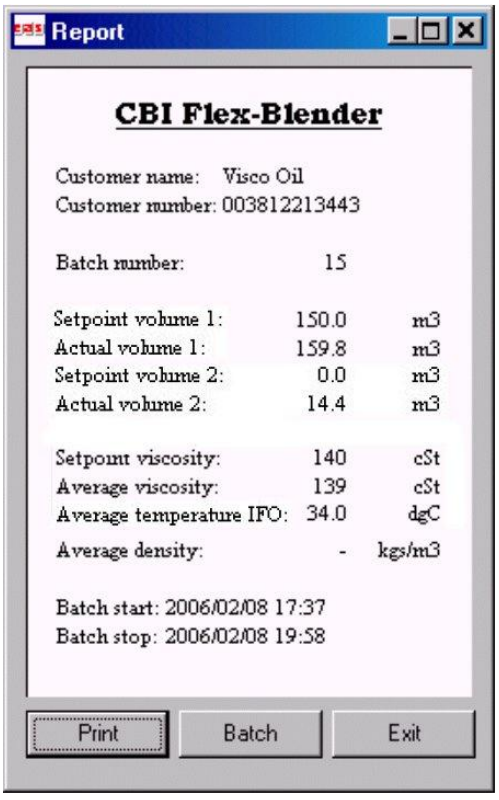
Batch waiting for flow to stop 19:50 (Set point 150m3 reached)

Flow stop 19:57 (Regulator stop and moving to stop position)

report ready 19:58 (Batch end and report ready)

Batch status window:

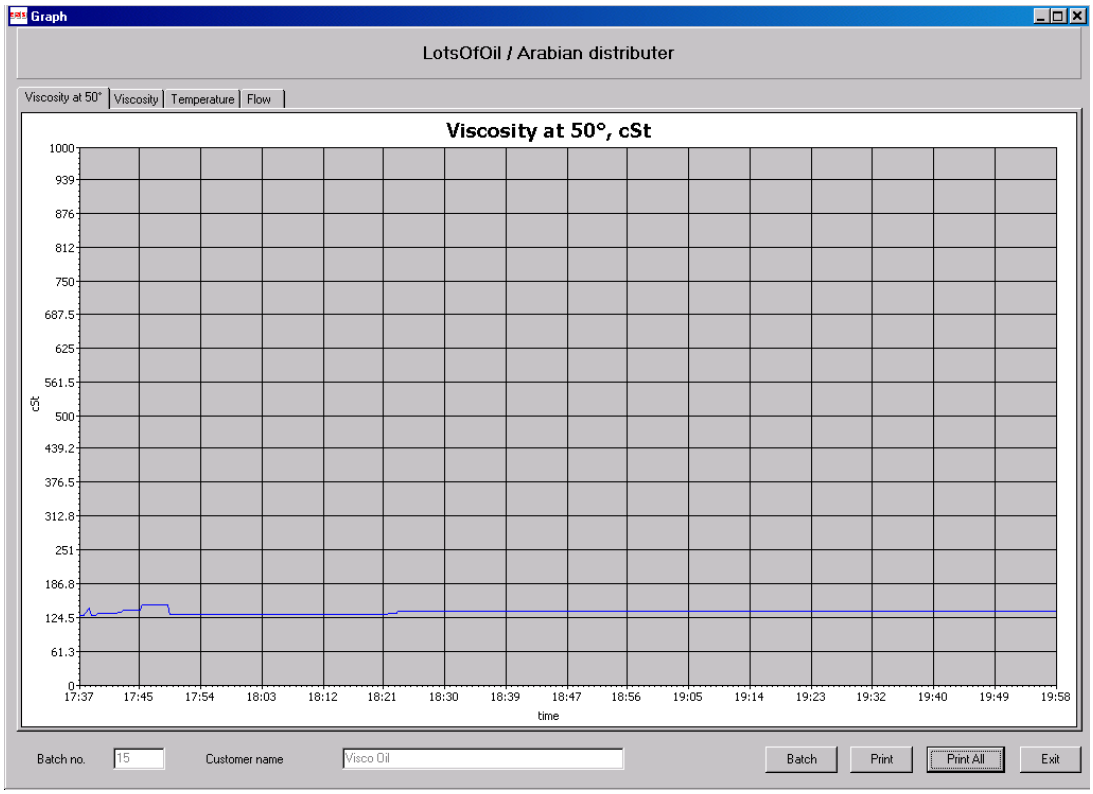
On screen report:

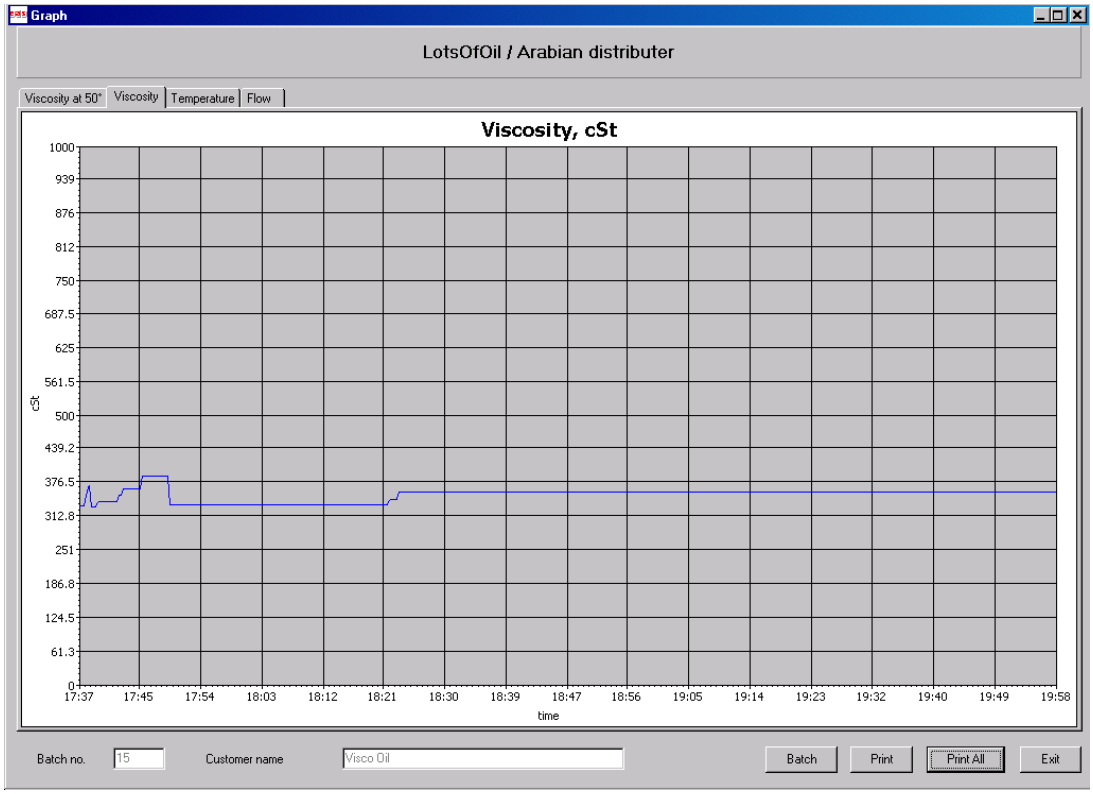


The following 2 pages are showing 4 graphs generated by batch 15.

Appendix 2.1

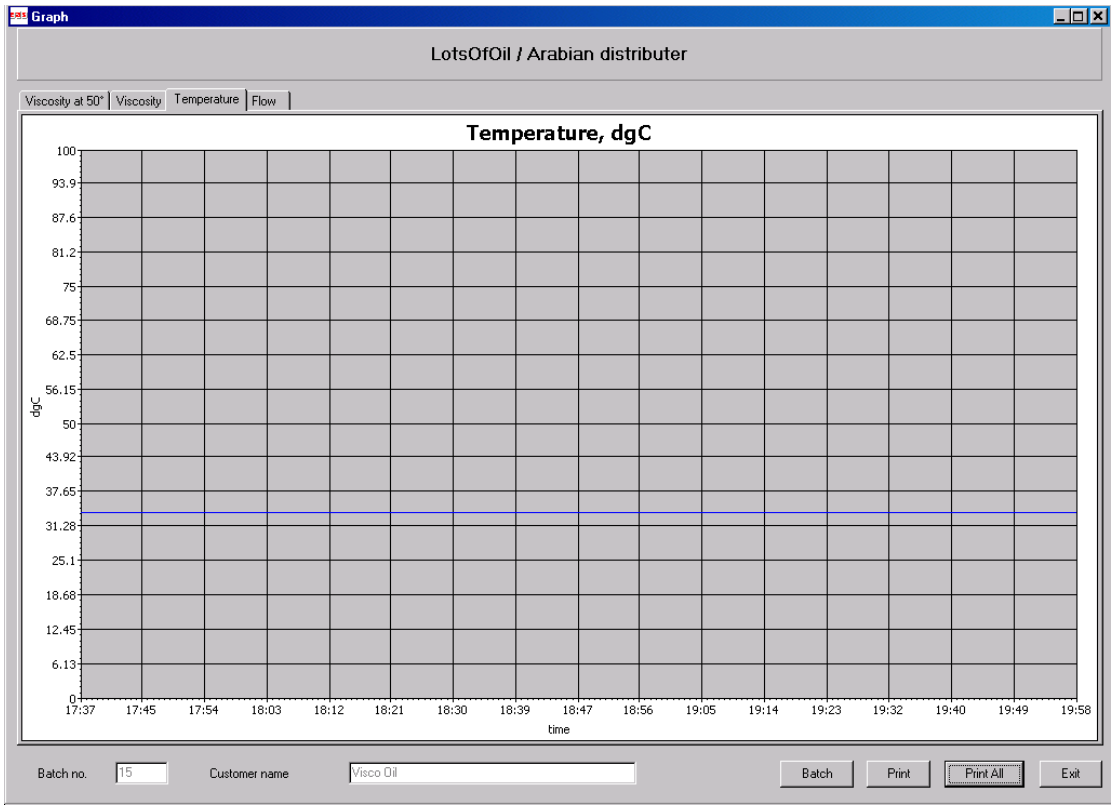
Graph examples.

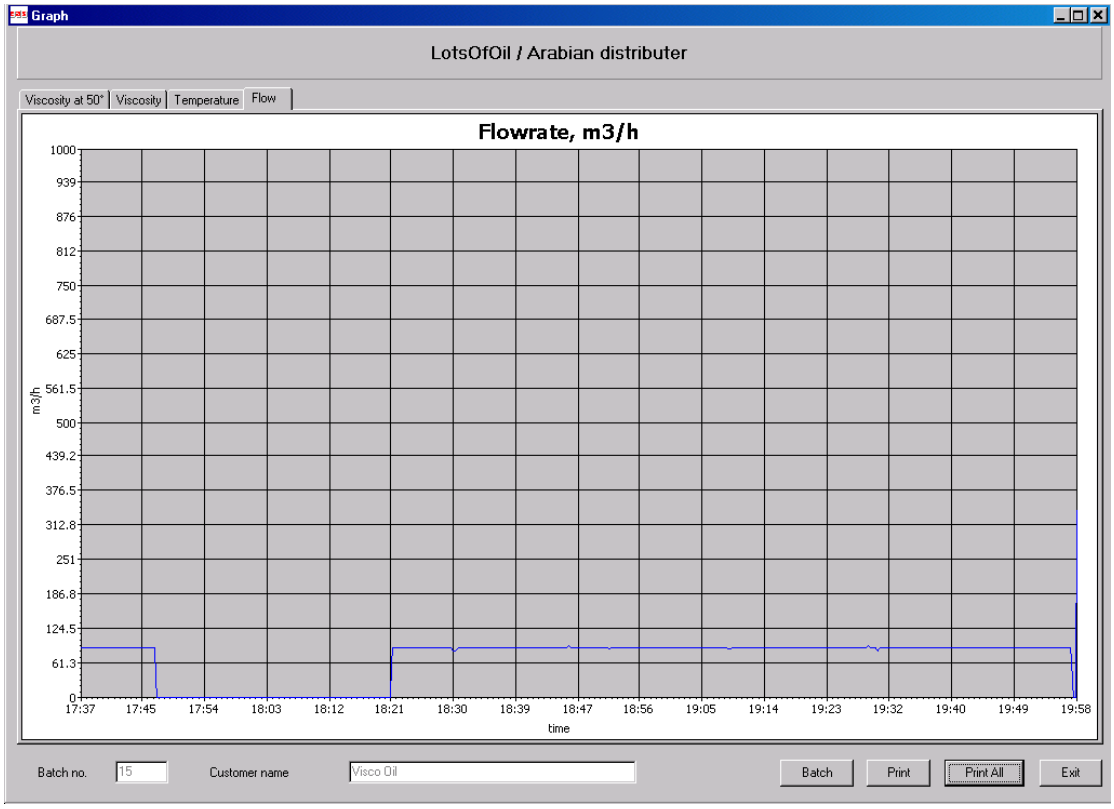




Appendix 2.2

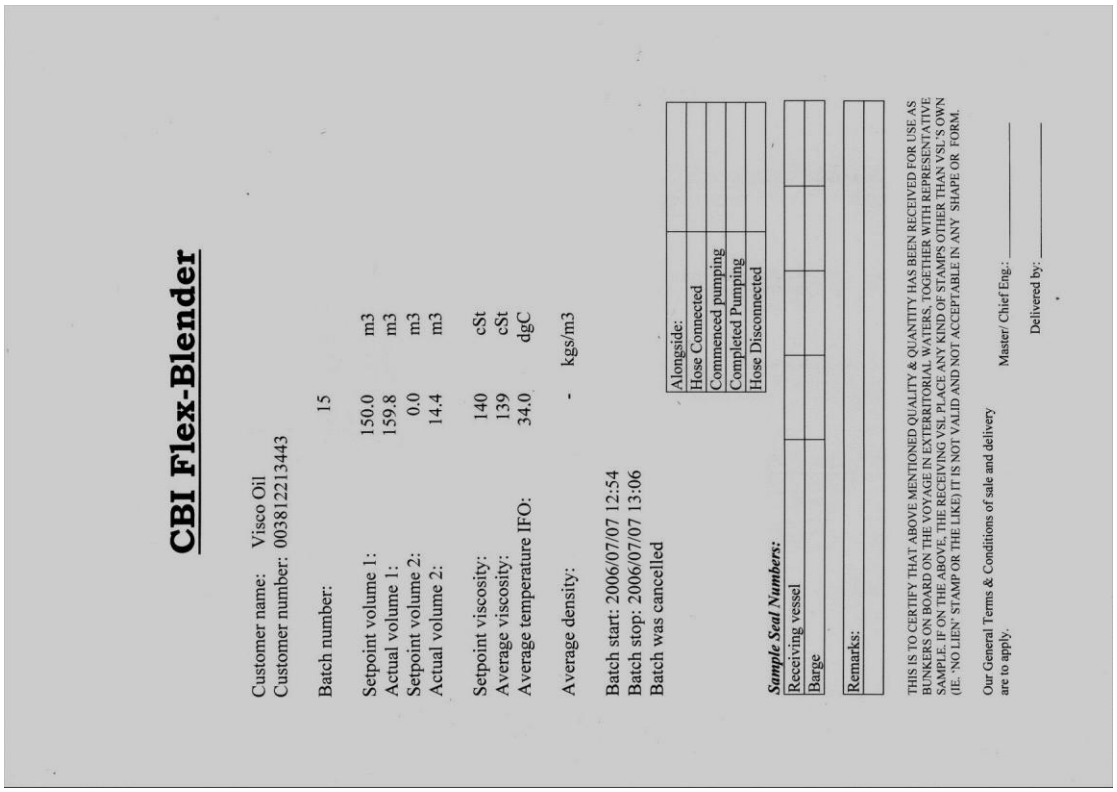
Graph examples.





Appendix 3.

Printout examples:



CBI Flex-Blender

Customer name: Visco Oil
Customer number: 003812213443

Batch number: 15

Setpoint volume 1:	150.0	m3
Actual volume 1:	159.8	m3
Setpoint volume 2:	0.0	m3
Actual volume 2:	14.4	m3
Setpoint viscosity:	140	cSt
Average viscosity:	139	cSt
Average temperature IFO:	34.0	dgC
Average density:	-	kgs/m3

Batch start: 2006/07/07 12:54
Batch stop: 2006/07/07 13:06
Batch was cancelled

Alongside:	
Hose Connected	
Commenced pumping	
Completed Pumping	
Hose Disconnected	

Sample Seal Numbers:

Receiving vessel				
Barge				

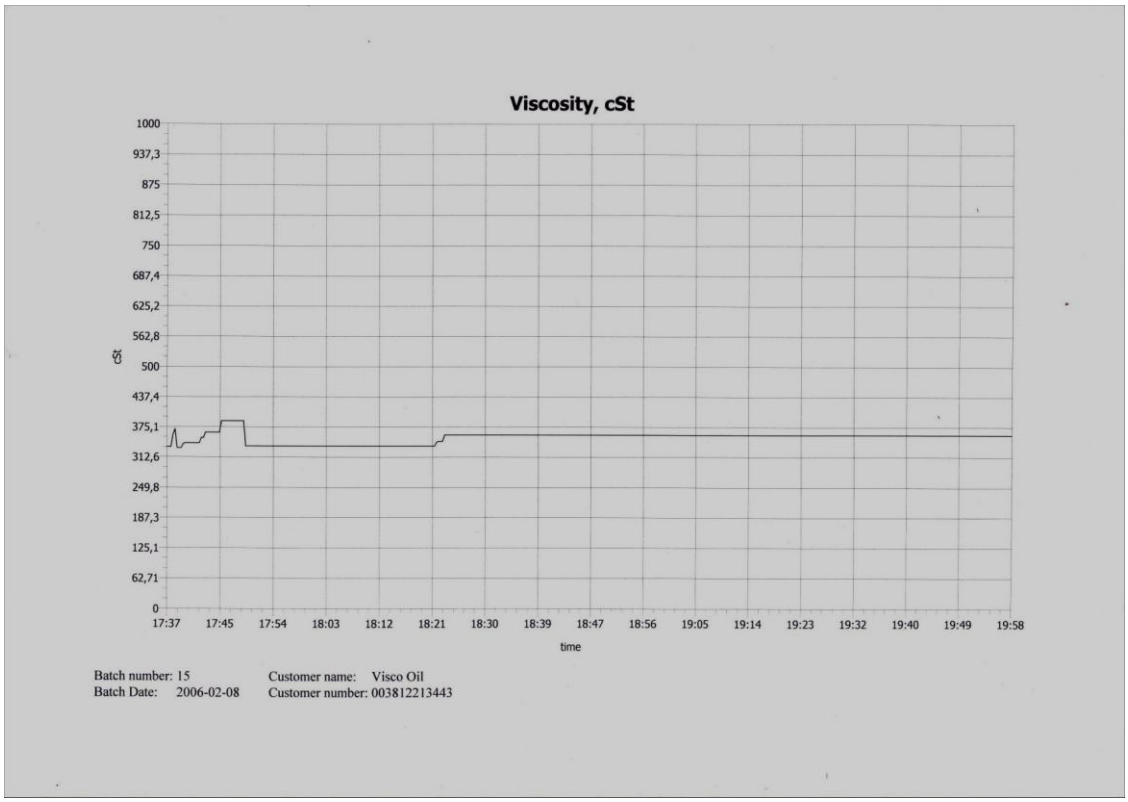
Remarks:

THIS IS TO CERTIFY THAT ABOVE MENTIONED QUALITY & QUANTITY HAS BEEN RECEIVED FOR USE AS BUNKERS ON BOARD ON THE VOYAGE IN EXTERRITORIAL WATERS, TOGETHER WITH REPRESENTATIVE SAMPLE, IF ON THE ABOVE, THE RECEIVING VSL PLACE ANY KIND OF STAMPS OTHER THAN VSL'S OWN (IE: 'NO LIEN' STAMP OR THE LIKE) IT IS NOT VALID AND NOT ACCEPTABLE IN ANY SHAPE OR FORM.

Our General Terms & Conditions of sale and delivery are to apply.

Master/ Chief Eng.: _____

Delivered by: _____



Appendix 4.

Software installation:

Recommended: Windows2000/XP. Minimum 128Mb ram, PII or equivalent.

The desktop video settings must be set to small fonts and computer including hard disk **must not** be allowed to go to stand by, which typically will cause the serial port to close.

The user interface fits a screen resolution of 1024*768 but higher resolutions is also ok if wanted. It is all right to let the screen go to pause after certain minutes.

Copy the folder BCS and BCS-Documentation to a hard-disk drive.

The file BCS.gdb is the database file.

The file BCS.exe is the system executable.

The file settings.ini is the initialisation file in which especially the com-port number to use can be preset. If anything else than com1 is used the file should be edited.

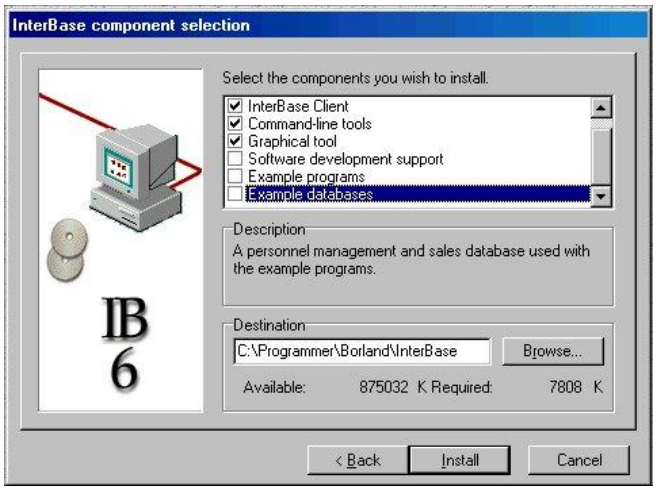
Make a shortcut to BCS.exe and place it on the desktop. Select “properties” for the shortcut just made and set the “run”-value to Maximized.

Continue with database installation!

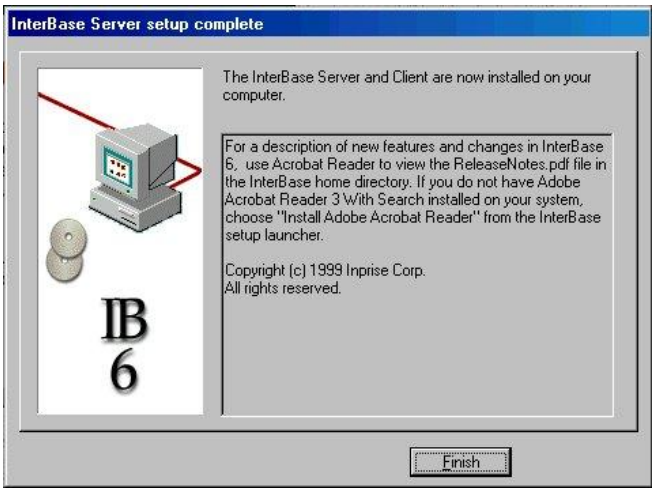
Database installation:

The BCS program is dependent of a database. The database has to be installed before the BCS program is activated for the first time. To install the database, follow these steps.

1) Unpack the ZIP file “InterBase_WI-V6.0.1-server” to a folder with the same name as the file.
2) Go to the folder generated, locate the file “Setup.exe” and double click it.
3) Press “Next” twice, “Yes” once and deselect 3 components as shown below. Then press “Install”. Press “OK” to the information window and “Finish” to the “complete” window. Now the database server is ready and BCS can be started as long as the database file is present in the BCS folder.



Information
Setup is unable to update one or more files because they are in use. These files will be updated the next time you reboot your computer.
Note: The InterBase Guardian and the InterBase Server will NOT run until your computer is rebooted.
Choose OK to continue.
OK

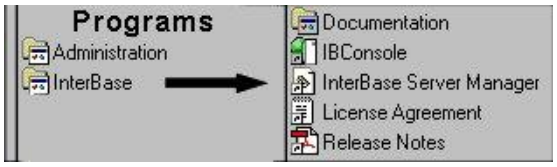

InterBase Server setup complete
The InterBase Server and Client are now installed on your computer.
For a description of new features and changes in InterBase 6, use Acrobat Reader to view the ReleaseNotes.pdf file in the InterBase home directory. If you do not have Adobe Acrobat Reader 3 With Search installed on your system, choose "Install Adobe Acrobat Reader" from the InterBase setup launcher.
Copyright (c) 1999 Inprise Corp.
All rights reserved.
IB 6
Finish

When you press finish, the BCS program is ready to run!

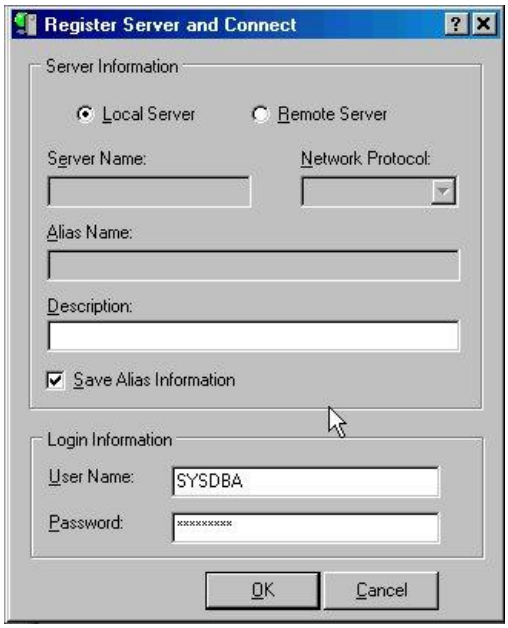
Database inspection:

If you want to be able to inspect and edit the database, the database file has to be registered as follows.

Under START-Programs, locate the folder “Interbase”.



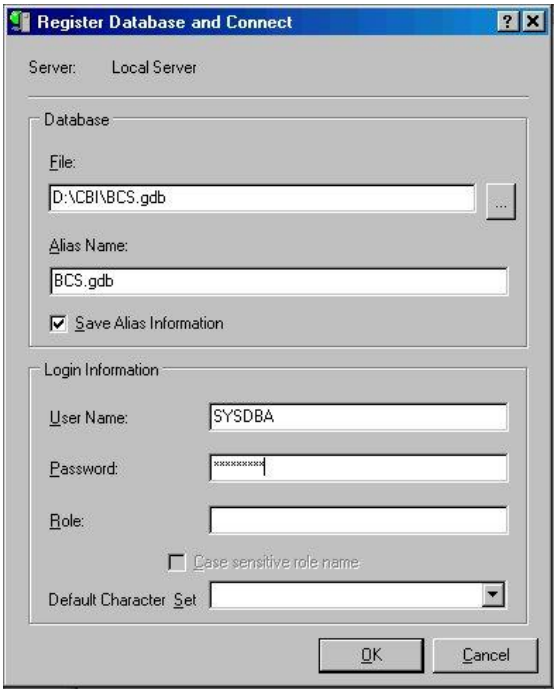
Click on IBConsole, right click “Interbase Server” and “Register”.



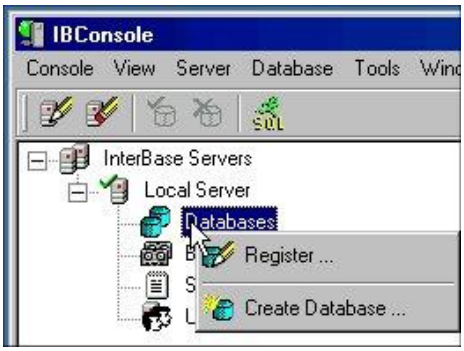
Key in:

User Name: SYSDBA

Password: master key



Then right click Database. Locate the file “BCS.gdb” and register with sameUsername and password as for the Server.



Database backup:

To backup the database, just copy save the file “BCS.gdb” in a safe place.

To use a backup copy, just overwrite or rename the present file (remember to make a backup copy before overwriting).

The IBConsole can be used for inspection of data saved to the database.